

tration; on this the Saxon Government appoints a representative or trustee whose duty it is to see that the statutes are obeyed; the works are supervised by boards of management appointed by the administration.

The employés possess the right of combination; they can be represented by their own committees, which may address the administration direct on any subject relating to the affairs of the concern. They are paid by piece-work, with a minimum time wage, and there is in the scheme a proviso by which no one, even though a member of the board of management, can receive a salary greater than ten times the average yearly earnings of workers of twenty-four years and over who have been at least three years with the firm. Moreover, when an employé has once received a certain wage and drawn it for one year his wage cannot be reduced because of slackness of trade. In addition to the wages calculated on the work done, every worker receives a share of the profits depending in any year on the net sum realised. There is also a liberal pension scheme, under which every employé who enters the works before his fortieth year is entitled, after five years' service, to a pension calculated at a rate which reaches 75 per cent. of his salary at the end of forty years' service, while the widows and orphans of employés have also pension rights. Finally, the working day is eight hours, and Abbe has put it on record in an address, delivered in 1901 to the Social Science Association, that in the case of 233 piece-workers about whom accurate statistics could be taken the total output was increased by 4 per cent. in the first year that followed the change from nine to eight hours.

Such has been Ernst Abbe's work; until 1903 he remained an active member of the board of management of the optical works; then he retired, partly on account of the state of his health, partly, if his health improved, to devote himself to his scientific work. The improvement hoped for never came, and he died last week, leaving it to the trained band of workers he had gathered round him to continue his task, and to show still further what can be done by the organised application of science to industry and manufactures.

R. T. G.

#### M. PAUL HENRI.

ABOUT the year 1864, two brothers entered the meteorological department of the Paris Observatory, and for nearly forty years laboured with zeal and success to promote the best interests of that institution and of astronomical science generally. In the autumn of 1903, one brother, M. Prosper Henri, died suddenly on a holiday tour, and we now have the melancholy duty of chronicling the death of the second brother, M. Paul Henri. It is necessary to recall the close and intimate relations that existed between these two, because the scientific life of one was that of the other. No one has ever thought of them separately, no one has ever attempted to discriminate between their successes and their triumphs. The same day (November 8, 1889) they were both elected associates of the Royal Astronomical Society, and other instances of similar recognition of their united work might be quoted. We may quote the words of the late M. Callandreau of these two:—"si unis que nous ne voyons souvent en eux qu'une seule personne pour ainsi dire, si oublieux de faire ressortir leur mérites respectifs qu'il est difficile de distinguer ce qui peut appartenir à chacun dans l'œuvre commune."

It is an oft-told tale to recall how these brothers,

with whom mechanical art was a conspicuous gift, constructed their own instruments, and laboured to complete the ecliptic charts on which Chacornac had worked, how their systematic work and diligence added to the number of small planets, and how, finally, the necessity was forced upon them of adopting improved methods in registering the places of stars in the crowded regions of the heavens. The history of the "International Chart of the Heavens," which has taxed the resources of so many observatories, was the outcome of their skill and resource. Not only did they provide the optical parts of the instruments that were employed in many observatories, but they laboured zealously on the zone allotted to the Paris Observatory, and it is believed brought their share to a successful issue. They led the way in the photographic examination of clusters like the Pleiades, and showed to others how unsuspected nebulae might be detected.

A new era of activity opened for astronomy in the general application of photography, and few have contributed more to the harvest of results that has followed that activity than have the brothers Henri. They not only supplied the instruments with which the negatives were taken, but they suggested devices for the construction of measuring machines by which these negatives could be discussed. The reputation of one and both rests on their photographic work: Smaller work, such as the careful and accurate delineation of planetary markings, the observation of minute satellites, and the more ordinary routine of observatory work, are all forgotten in the large share taken in the application of photography to celestial measurement. His colleagues in the observatory spoke of the many excellent qualities that distinguished M. Prosper Henri as a colleague and friend, and one is sure that no less kindly expressions will be used towards M. Paul Henri, who has enjoyed the confidence and respect of all the directors of the Paris Observatory who have followed M. Le Verrier.

W. E. P.

#### NOTES.

THE cross of officer of the Legion of Honour has been conferred, *La Nature* states, upon Dr. Otto Nordenskjöld for his South Polar explorations. Mrs. Bullock Workman has been appointed Officier de l'Instruction publique for her travels in the Himalayas.

THE autumn meeting of the Iron and Steel Institute is to be held this year in Sheffield for the first time. Mr. R. A. Hadfield has been elected to succeed Mr. Andrew Carnegie as president of the institute. The visit will take place during the week beginning September 25. The most influential members of the Sheffield steel industry have associated themselves with the invitation to the institute, and a committee has been formed, of which the Lord Mayor of Sheffield and the Master Cutler are chairman and vice-chairman respectively. Colonel H. Hughes, C.M.G., has been appointed chairman of the reception committee, with Mr. J. Rossiter Hoyle as honorary secretary. Mr. Frank Huntsman—who is, we learn from the *Times*, a descendant of the Huntsman who founded the Sheffield industry of melting steel in pots about 170 years ago—will act as honorary treasurer, and Mr. John Wortley as honorary assistant secretary.

ON Thursday next, February 2, Prof. W. Schlich will deliver the first of a course of two lectures at the Royal Institution on "Forestry in the British Empire." The discourse on Friday, February 3, will be delivered by Prof. T. Clifford Allbutt on "Blood Pressure in Man."

THE International Congress of Psychology will meet this year at Rome on April 26-30. We learn from the *British Medical Journal* that there will be four sections. The section of experimental psychology, the president of which is Prof. G. Fano, of Florence, will deal with psychology in its relations to anatomy and physiology, psycho-physics, and comparative psychology. That of introspective psychology will, under the presidency of Prof. R. Ardigo, of Padua, devote itself to psychology in its relations to philosophical sciences. The section of pathological psychology, the president of which is Prof. E. Morselli, of Genoa, will discuss hypnotism, suggestion, and analogous phenomena, and psycho-therapeutics. The programme of the section of criminal, pædagogic, and social psychology, which is under the presidency of Prof. Lombroso, of Turin, has not yet been published. The president of the congress is Prof. Giuseppe Sergi, of Rome; the general secretary, Dr. Sante de Sanctis, to whom all communications relative to the meeting should be addressed at the Istituto Fisiologico, 92 Via Depretis, Rome.

WE are informed that Dr. Carl Otto Weber, the well known chemical authority on india-rubber, died suddenly on January 14 at his residence in Massachusetts, U.S.A.

ON November 16 last the University of Lehigh was bereaved of its president, Dr. Thomas Messinger Drown, and a brief obituary notice is contained in the *Popular Science Monthly* for January. Dr. Drown was born on March 19, 1842, at Philadelphia, and he graduated in medicine at Pennsylvania, subsequently studying chemistry in Germany and America. He held the chair of chemistry at Lafayette College for seven years, and at the Massachusetts Institute of Technology for seven years. He was secretary and editor of the American Institution of Mining Engineers for ten years from its foundation, and was elected president in 1897. His researches in quantitative analysis were devoted in the first place to devising standard methods in the analyses of iron and steel, and in the second place to water analysis, especially in connection with the natural waters of the State of Massachusetts, and the distribution of normal chlorine. He was elected president of Lehigh University in 1895, at a time when that institution's influence was at a low ebb, and since his appointment the efficiency of the college has developed in many important directions.

REUTER'S Agency has been informed by the Pacific Cable Board that by an arrangement between the Washington and Sydney Observatories, with the cooperation of the telegraph administrations concerned, time signals were sent on New Year's Eve from the Washington Observatory to the Sydney Observatory at 3h., 4h., 5h., and 6h. The mean interval between the times when these signals were sent and when they were received was 2.90s. The distance separating Sydney and Washington is more than 12,000 miles. The signals through the Vancouver-Fanning cable, the longest cable span in the world (3457.76 nautical miles), were sent by automatic apparatus, and were recorded, as they passed, at the Vancouver station on an instrument placed in the artificial line which balances the cable for the purpose of duplex working. The signals consisted of second contacts, omitting the thirtieth and last five of each minute, except the last minute of the hour, when the thirtieth and all after the fiftieth second were omitted, the circuit closing with a long dash on the even hour. The signals were sent for five minutes before the hour from 3 p.m. to 6 p.m., Sydney time; equivalent to midnight to 3 a.m. Washington time.

WRITING from Amsterdam, Dr. C. M. van Deventer desires to direct attention to an interesting fact observed by a schoolboy. Two years ago, during a lesson in physics given at the high school at Batavia, one of the boys, called Van Erpecum, told Dr. Deventer, as an observation of his own, that the water in a glass, filled to the brim with water and floating ice, does not flow over when the ice melts. The observation was communicated to Profs. Van der Waals and Zeeman, who judged it worthy of being the subject of a note presented by them to the Royal Academy of Amsterdam. Dr. Deventer says that the observation of his pupil tells only the half of the phenomenon—the truth being that the water neither rises nor sinks. He therefore states the proposition that “In a vessel containing water and floating ice, the level stays at the same height when the ice melts.” Or, speaking more generally, “When a vessel contains a solid floating in its own liquid, the level of the latter does not change by the melting of the solid.” This proposition Dr. Deventer proposes to call the “law of the permanent level.” The law can be deduced from Archimedes's principle; but it is only rigorously exact when the weight of the air is neglected.

AT the meeting of the Society of Antiquaries on January 19 Mr. A. J. Evans communicated an account of the tombs of Minoan Knossos. Mr. Evans's last season's work at Knossos was devoted largely to the search for the tombs in relation with the Minoan palace and city. On a hill about a mile north of the palace a cemetery was discovered. One hundred tombs were opened, and the contents showed that the bulk of them belonged to the period immediately succeeding the fall of the palace. The character of the art displayed by the relics found showed the unbroken tradition of the later palace style. The jewelry and gems discovered were of the typical “mature Mycenaean” class, and a scarab found in one of the graves is of a late eighteenth dynasty type. The tombs were of three main classes:—(a) Chamber tombs cut in the soft rock and approached in each case by a *dromos*; in many cases these contained clay coffins, in which the dead had been deposited in cists, their knees drawn towards the chin. (b) Shaft graves, each with a lesser cavity below, containing the extended skeleton, and with a roofing of stone slabs. (c) Pits giving access to a walled cavity in the side below; these also contained extended skeletons. A number of skulls have been secured, and are to be sent to England. On a high level called Sopata, about two miles north again of this cemetery, an important sepulchral monument was discovered. This consisted of a square chamber, about eight by six metres, constructed of limestone blocks, and with the side walls arching in “Cyclopean” fashion towards a high gable. The back wall was provided with a central cell opposite the blocked entrance. This entrance, arched on the same horizontal principle, communicated with a lofty entrance hall of similar construction, in the side walls of which, facing each other, were two cells that had been used for sepulchral purposes. A second blocked archway led from this hall to the imposing rock-cut *dromos*. A number of relics were found scattered about, including repeated clay impressions of what may have been a royal seal. Specially remarkable among the stone vessels is a porphyry bowl of Minoan workmanship, but recalling in material and execution that of the early Egyptian dynasties. Many imported Egyptian alabaster were also found, showing the survival of middle empire forms besides others of early eighteenth dynasty type. Beads of lapis lazuli were also found, and

pendants of the same material, showing a close imitation of Egyptian models. The form of this mausoleum, with its square chamber, is unique, and contrasts with that of the tholos tombs of mainland Greece. The position in which it lies commands the whole south Ægean to Melos and Santorin, and Central Crete from Dicta to Ida.

WE have to welcome an addition to the already lengthy list of American biological serials in the form of a *Bulletin* issued by the Springfield (Mass.) Museum of Natural History, of which the first number is in our hands. This is devoted to the description of the early stages in the development of the ground-beetles of the family Carabidæ, as exemplified by a member of the genus *Dicælus*, in which the larva is of the ordinary predaceous type, and one of *Brachinus*, in which the larva is parasitic and degenerate. Of the adult beetles, the more specialised seems to be *Brachinus*. The authors of the paper are Messrs. Dimmock and Knab.

THE Albany Museum, according to the report for the first half of 1904, continues to make steady progress, and it is satisfactory to learn that arrangements are under consideration both for augmenting the staff and for increasing the size of the building. An important part of the museum's work is the investigation of the life-history of insects injurious to agriculture and horticulture, and the discovery of the best means of checking their ravages. For this purpose a piece of ground adjoining the museum has been enclosed, and it is hoped that funds will shortly be forthcoming for erecting in this enclosure an insect-house, without the aid of which the work can be carried on only with difficulty.

THE *Field Naturalists' Quarterly* for December, 1904, strikes us as being an unusually excellent number. It includes, in the first place, the second of the series of plates illustrating the development of the frog. Later on we have the first instalment of a set of articles by the editor (Dr. G. Leighton) explaining modern investigations on heredity in a manner calculated to bring home the fundamental truths of this complex subject to every intelligent reader, the development of the germ-plasm being the text of this contribution. In a preliminary note the editor expresses the hope that his articles will induce many persons who reside in the country to take up the practical investigation of some form of heredity for themselves. A third article to which we may direct attention is one by Mr. H. E. Forrest in which simple methods of distinguishing the various species of British bats are formulated. We notice that the author adheres to the old-fashioned nomenclature for the members of this group.

WE have received the January number of *Climate*, which contains an illustrated description of the Japanese soldier's outfit, and articles on blackwater fever, water and its connection with disease, the drinking habits of native races, climate and health in hot countries, &c. The medical articles are semi-popular in character, and should be useful to missionaries and others stationed in districts remote from medical aid.

THE *Journal* of the Royal Sanitary Institute (vol. xxv., part iii.) forms a bulky volume of some 600 pages. It contains a number of interesting and important papers and discussions thereon contributed to the congress of the institute at Glasgow last year. They are on such varied subjects as disinfection in phthisis (Prof. Kenwood and Dr. Allan), prevention of diphtheria (Dr. Cobbett), sewage disposal, school hygiene and ventilation, conditions of housing, &c.

THE December (1904) number of the Johns Hopkins Hospital *Bulletin* (vol. xv., No. 165) contains an account of the opening of the new surgical building and clinical amphitheatre of the Johns Hopkins Hospital, a description of a new chromogenic bacillus, *B. cyaneum*, and various papers of medical interest. In the new buildings a tablet has been erected to the memory of Dr. Jesse Lazear, who died from an attack of yellow fever while investigating that disease in Cuba.

IT is proposed to add to Reichenbach's "*Icones Floræ Germanicæ et Helveticæ*" a number of extra volumes containing monographs of critical genera. The publishers, Messrs. von Zezschwitz, of Gera, announce the immediate issue of the first of these, in which the genus *Hieracium* is treated by Dr. J. Murr and Mr. H. Zahn.

THE cultivation of mushrooms is not such an important business in the United States of America as in Great Britain and France. With the view of extending and improving the trade, Prof. B. M. Duggar has written a pamphlet on the subject, which has been issued by the U.S. Department of Agriculture as a *Farmers' Bulletin*. The preparation of English brick spawn and French flake spawn is dependent upon the haphazard collection of what is known as "virgin spawn" in the open. Prof. Duggar has for some time attempted to discover the conditions which are necessary for the germination of mushroom spores. He has already succeeded in germinating spores in pure cultures by means of chemical stimulation, and hopes shortly to make the process more practical. This will enable the grower to produce a definite strain, and if necessary to obtain improved varieties by selection.

THE *Ani-i-Akbari*, or annals of the Emperor Akbar, written in the Persian language, contain descriptions of various customs which prevailed during the Moghul period. Amongst these was the use of perfumes in religious observances, and the emperor took a personal interest in the preparation of the ingredients. A short summary of the principal substances and their sources is contributed by Mr. D. Hooper to the October (1904) number of the *Calcutta Review*. Among vegetable products, *Aquilaria agallocha*, aloë-wood, was then as now valued for the oleo-resin agar, and an oil known as chuwah; sandalwood was used as a powder, and perfumes were distilled from the rose, orange, jasmine, and broad-leaved willow, *Salix caprea*. Ambergris obtained from the sperm whale, the moist secretion of the civet cat, and the opercula of certain molluscs, known as "fingernails," were important animal products.

PAMPHLET series No. 32, issued by the Imperial Department of Agriculture for the West Indies, gives a summary of the results on the cultivation of seedling and other canes at the Barbados experiment stations in 1904. As in previous years the investigation has been conducted by Prof. d'Albuquerque and Mr. Bovell. Sixteen sugar estates in typical localities were selected, thirteen on black soils and three on red soils. The seedlings were treated in precisely the same manner as the ordinary canes. The season was favourable, there was very little root disease, and the crop consequently was above the average. Cane B 208 again gave uniformly good results, both as plant canes and ratoons, and it is recommended for a general trial on a field scale in all red soil districts. A newer cane, B 1529, however, takes the first place in the black soil list, coming out second to B 208 in the red soil list. Its cultivation will consequently be extended to as many experimental plots as possible. Cane B 147, at one time



considered the most promising of the seedling varieties, did not give such good results as in previous years, but it appears to be cultivated with some success in the rather light soils in the parish of St. Philip.

THE Barbados *Official Gazette* of December 19, 1904, contains some correspondence relating to Cassava poisoning. Mr. Briggs, one of the district coroners, noted to the Colonial Secretary that witnesses in inquest cases frequently assert that if roasting and poison cassava grow closely side by side, the roasting cassava takes up some of the poison from the poison cassava; also that the roasting cassava gets a "spring in it," and that makes it poisonous. The Colonial Secretary submitted the note to Sir Daniel Morris, who replied that (1) "there can be no direct connection between the two plants, and it is impossible that the poison can pass through the soil from the poisonous cassava to the sweet," and (2) "if by the 'spring in it' is meant that the plant starts into second growth after heavy rain, it is probable that certain changes may take place inducing an increase of the poisonous quality." What probably happens when persons die from eating sweet or roasting cassava is that it is either too old or it has not been sufficiently cooked to drive out all the acid. It is only really wholesome when the roots are not too old, and when they have been cooked until they are quite soft. If the centre is hard it is probably more or less poisonous, and should not be eaten. Even properly cooked cassava which has been allowed to become cold is not fit to eat unless it is cooked a second time.

BECKELITE, a new mineral species named in honour of Prof. F. Becke, of Vienna, is described by Prof. J. Morozewicz in the December (1904) *Bulletin* of the Cracow Academy of Sciences. It occurs as an accessory constituent of a dyke-rock composed of albite, nephelite, ægirite, and magnetite in the elæolite-syenite complex near Mariupol, on the Sea of Azov. The wax-yellow octahedral or rhombic-dodecahedral crystals resemble pyrochlore in general appearance and physical characters, though the somewhat indistinct cleavage is cubic instead of octahedral. Chemically, however, the new mineral is quite distinct from pyrochlore, containing 17.13 per cent. of silica and 65.31 per cent. of rare earths, with no niobium or tantalum. The formula is  $\text{Ca}_2(\text{Ce}, \text{La}, \text{Di})_2\text{Si}_2\text{O}_{15}$ , which presents a certain resemblance to the garnet formula with rare earths in place of alumina. From analogy to calcium "alumosilicate," the new mineral is described as a calcium cerolanthano-didymo-silicate.

FOR the twenty-second time, the climatological records of the British Empire are summarised in the current number of *Symons's Meteorological Magazine*, viz. for the year 1903. The stations number twenty-five, but, as the editor points out, it is impossible to represent the average conditions of the climate of the Empire by so small a number of stations, however well distributed. Adelaide, which has almost constantly held the first place in the summary for extreme maximum temperature, now, as in 1902, gives way to Coolgardie, in Western Australia, where the shade temperature reached  $113^{\circ}.4$  on January 27; the lowest shade temperature was  $-60^{\circ}.8$  at Dawson on January 26. Dawson had also the greatest yearly range ( $150^{\circ}.3$ ). The greatest mean daily range was  $23^{\circ}.5$  at Winnipeg, and the least  $8^{\circ}.5$  at Hong Kong. London had the highest relative humidity (82 per cent.) and Adelaide the lowest (62 per cent.). The greatest rainfall, 93.67 inches, was recorded at Hong Kong, and the least, 10.74 inches, at Dawson. We may mention, incidentally, that

the present number of the magazine is the largest since its foundation in 1866; we hope to refer shortly to another of the interesting articles that it contains.

WE have received the *Journals* of the Meteorological Society of Japan for October and November last. They contain (as we see from the English titles) several interesting articles in Japanese. There is also one in English, on the duration of rainfall, by T. Okada. The object of the author is to show that Dr. Köppen's formula for the calculation of the probable duration of rainfall in a month, or any interval of time, from three or six observations daily, holds good for all climates. The calculation is very simple, and the formula in question,  $(r/n)N$ , is contained in an article by Dr. Köppen in the Austrian *Meteorologische Zeitschrift* for 1880;  $n$  is the total number of observations,  $r$  that of observations with rainfall, and  $N$  the total number of hours in a month (or other period). The author shows that the duration of rainfall, computed from tri-daily observations, does not differ materially from that computed from hourly observations—in the annual mean at most 4 per cent., and in the monthly mean 18 per cent. In the majority of cases the differences are much less; the method gives more approximate results than an ordinary self-recording rain-gauge, owing to the usual want of sensibility of such instruments.

IN the *Zeitschrift für physikalischen und chemischen Unterricht*, xvii., 5, Mr. Walter Stahlberg, of Steglitz, gives an account of the Zeiss "Verant" by which photographs are made to stand out in natural relief with monocular vision. The apparatus can hardly be correctly described as a stereoscope, since one of the most important features of the stereoscope depending on binocular vision is absent. The Verant is a single lens, the focal length of which should be equal to that of the camera used in taking the photographs, and this lens is convex-concave, so that the axes of the pencils from different parts of the picture meet in the eye. From Mr. Stahlberg's account, we think the principle of the Verant may be roughly explained by the following illustration:—When a photograph of cloisters is taken from one corner in the interior the photograph gives the impression that the two colonnades meet at a very acute angle instead of at right angles. If the picture were seen through the Verant the angles would appear correct as they would to a person standing in the cloisters themselves. The now old-fashioned graphoscope appears to have had a somewhat similar purpose.

Two papers which are of importance in the study of superfusion phenomena are published by Drs. Tullio Gnesotto and Gino Zanetti in the *Atti* of the Royal Venetian Institute (1903, vol. lxii., p. 1377). By means of a modified ice calorimeter, the variation of the specific heat of superfluid liquid sodium thiosulphate at temperatures between  $0^{\circ}$  C. and the melting point of the salt,  $48^{\circ}.8$  C., was determined, the observations being also extended above this temperature up to  $100^{\circ}$  C. On calculating the specific heat at all temperatures within this range, it is seen that in the neighbourhood of the melting point a sudden diminution in its value occurs, but that slightly above this temperature the specific heat again increases, so that the curve resumes the same direction that it had below the melting point. The latent heat of fusion of the salt at  $0^{\circ}$  C. was also determined.

A VALUABLE paper on the properties of chrome-vanadium steels was read before the Institution of Mechanical Engineers on December 16, 1904, by Captain Riall Sankey

and Mr. J. Kent Smith. These steels appear to be most valuable from their power of resisting rapid alternations of stress and sudden shock, especially after they have been subjected to special thermal treatment. The temperature of their recalcence is at about  $715^{\circ}$  C., and the effect of quenching in oil from  $900^{\circ}$  C. and subsequently reheating at  $600^{\circ}$  C. is to increase enormously the resistance of the alloy to shock, as measured by an impact test, and to alternations of stress, without affecting the tensile strength. A spring of chrome-vanadium steel which was prepared was found to have double the strength of an ordinary steel spring of the same dimensions, the extension being directly proportional to the load throughout a very much wider range. Like the nickel steels, those which contain vanadium and chromium are very efficient in withstanding bending tests.

MESSRS. DAWBARN AND WARD, LTD., have added a booklet, "How to Read a Workshop Drawing," by Mr. W. Longland, to their "Home-Worker's" series of practical handbooks.

A THIRD edition of Mr. M. M. Pattison Muir's translation of Prof. Lassar-Cohn's "Chemistry in Daily Life" has been published by Messrs. H. Grevel and Co. The book has been revised and enlarged.

A TEACHERS' edition of part ii. of "Elementary Algebra," by Messrs. W. M. Baker and A. A. Bourne, has been published by Messrs. George Bell and Sons. Teachers are likely to find the plan of printing the answers on the page opposite to the examples a convenience in class work.

THE Engineering Standards Committee has just issued the "British Standard Specification for Portland Cement." The specification deals with the quality and preparation of the cement, gives particulars as to sampling and preparation for testing and analysis, and goes on to enumerate what should be its fineness, specific gravity, chemical composition, &c. The specification also considers at length the various tests which a satisfactory cement should pass. Copies of the publication may be obtained from Messrs. Crosby Lockwood and Son, price 2s. 6d. net.

THE 1905 issue of "Hazell's Annual" has now been published. Twelve pages are devoted to scientific progress during 1904, and about five to scientific societies and institutions. Education in the United Kingdom in all its branches is given some fourteen pages.

### OUR ASTRONOMICAL COLUMN.

THE REPORTED SIXTH SATELLITE OF JUPITER.—A telegram from the Kiel Centralstelle gives the position of a minor planet, P.V., photographed by Prof. Wolf on January 23.135 at the Konigstuhl Observatory, at 7h. 8.8m. (Konigstuhl M.T.), as

R.A. = 1h. 31m. 59s., dec. =  $+8^{\circ} 36' 13''$ .

The daily movement of this object is  $+23'$  in R.A. and  $-9'$  in declination, and it is suggested that the body may possibly be identical with the object announced by Prof. Perrine as a sixth satellite to Jupiter.

PERIODICAL COMETS DUE TO RETURN IN 1905.—In the January *Observatory* Mr. W. T. Lynn directs attention to the periodical comets which are due to return to perihelion this year. There are only two, of which the first, Encke's, has already been seen, and passed through perihelion on January 4. The second is that discovered by Prof. Max Wolf on September 17, 1884 (comet iii., 1884),

which has a period, variously estimated, of about 6.76 years. This object returned as comet ii., 1891, and comet iv., 1898, its perihelion being passed during the latter return on July 4, although its nearest approach to the earth did not take place until the end of November. Accordingly it should again pass through perihelion early in April next.

CHANGES ON THE SURFACE OF JUPITER.—An interesting popular exposition of the knowledge acquired during the past twenty-five years concerning the conditions of, and the changes on, the visible surface of Jupiter is given by Prof. G. W. Hough in No. 1, vol. xiii., of *Popular Astronomy*.

Prof. Hough's own observations of Jupiter have extended over twenty-five years, and the present article summarises them and the conclusions to which they have led him. He particularly refers to the determined values for the rotation periods at different latitudes, and sees no evidence for the existence of any law connecting the two, giving diagrams which illustrate the point. Two other diagrams show the variations in the latitude and the rotation period of the great red spot from 1879 to 1903, whilst yet another illustrates the changes in the position and width of the equatorial belt during the period 1895-1904. From the latter diagram it is seen, very clearly, that the changes in the northern part of the belt are much more sudden and of a greater magnitude than those which take place in the southern portion.

STARS HAVING PECULIAR SPECTRA.—During the examination of the Henry Draper memorial plates, Mrs. Fleming has discovered some additional stars which are either variable or have peculiar spectra. Thirty-one of these are announced and briefly described in No. 92 of the Harvard College Observatory *Circulars*. Of those having peculiar spectra a few are worthy of special notice. For instance,  $\lambda$  Cephei (mag. 5.6) was found to have a spectrum identical with that of  $\epsilon$  Puppis, which hitherto has been regarded as unique. The stars D.M. -  $11^{\circ} 1460$  (Monoceros) and  $+64^{\circ} 1527$  (Cepheus), amongst others, show a bright H $\beta$  line. In the former the other hydrogen and the helium lines are double, whilst in the latter they are single but broad. The spectrum of D.M.  $+39^{\circ} 4368$  (R.A. = 20h. 51.6m., dec. =  $+39^{\circ} 55'$ , mag. = 7.2), as photographed on September 15, 1904, was continuous, showing no trace of lines, although the lines in the spectra of neighbouring stars were sharply defined; on other plates the hydrogen lines show faintly, although the spectrum was not so well defined.

REAL PATHS, HEIGHTS, AND VELOCITIES OF LEONIDS.—From the observational data submitted to him by various observers, Mr. Denning has computed the real paths, heights above the earth's surface, and velocities of several Leonids seen during the last shower. From three observations of the brightest meteor seen at Greenwich, at 16h. 24m. 42s., November 16, 1904, he finds that the height of this object was from 88 to 44 miles along a path extending not more than 60 miles from near Petersfield to Hungerford. The velocity was about 46 miles per second, and the radiant point was  $151^{\circ} + 22^{\circ}$ .

A second meteor recorded by two observers was seen at Greenwich, at November 14d. 10h. 26m., and at Enniscorthy (Ireland), 280 miles away. This had a long horizontal flight from over the neighbourhood of Sheffield to near Carmarthen, and was 83 to 78 miles high, the velocity being about 40 miles per second. Another meteor travelled at a height of 79 to 58 miles from over Faringdon to Stroud, its visible path being 35 miles long and its velocity 39 miles per second (*Observatory*, January).

NEW METHOD FOR MEASURING RADIAL-VELOCITY SPECTROGRAMS.—At a meeting of the International Congress of Arts and Sciences held at St. Louis in September, 1904, Prof. J. Hartmann, of Potsdam, gave a brief outline of a new method whereby he proposes to reduce considerably the labour involved in measuring the displacements of lines in stellar spectra for the purpose of determining the radial velocities of the stars. Hitherto it has been customary to measure the displacement of each line separately, and subsequently to reduce the individual measures; but in Prof. Hartmann's new method the dis-